METHOD AND APPARATUS FOR FACILITATING COMMUNICATION BETWEEN A USER AND A TOY

BACKGROUND OF THE INVENTION

[0001] The present invention relates to methods and apparatuses for facilitating communication between a user and a toy and, more particularly, to the use of radio frequency tags in facilitating such communication.

[0002] With reference to FIG. 1, a convention apparatus 10 is shown which facilitates communication between a base 12 and a toy 14 to facilitate a semi-interactive play experience for a child (not shown). The base 12 includes a microprocessor 16, an audio circuit 18 and a query circuit 20. The toy 14 includes a responder 22. In operation, the query circuit 20 outputs a pulse signal, usually in the radio frequency spectrum, that is received by the responder 22 of the toy 14. The responder 22 produces a response signal, also in the radio frequency spectrum, in response to the pulse signal from the query circuit 20 of the base 12. The query circuit 20 is further operable to detect the response signal from the responder 22 and to provide an indication to the microprocessor 16 of the proximity of the toy 14. When the microprocessor 16 receives an indication of the proximity of the toy 14, it commands the audio circuit 18 to produce an audible signal directed to the child.

[0003] Unfortunately, the conventional method and apparatus suffers from a number of disadvantages, e.g., the audible signals issued from the audio circuit 18 of the base 12 bear no relationship to the relative positions of the child and the toy 14. Rather, the audible signals from the base 12 are a function of the relative positions of between the toy 14 and the base 12. This severely limits the scope of interactive play between the child and the toy 14. Further, there is no relationship between the audio signal from the base 12 and the surroundings in which the base 12, the toy 14, and the child are located. Indeed, the only variable that affects the

audible signal issued by the audio circuit 18 is the proximity and/or orientation of the toy 14 with respect to the base 12.

[0004] Accordingly, it would be desirable to employ new methods and/or apparatuses for facilitating communication between a user, for example a child, and a toy which take into account the proximity of the user to the toy and/or the surroundings in which the user and toy are located, thereby greatly expanding the range of interactive play enjoyed by the user.

SUMMARY OF THE INVENTION

[0005] In accordance with at least one aspect of the present invention, an apparatus includes: at least one mobile item operable to be carried by a user and including a radio frequency tag operable to produce an answer electromagnetic wave in response to a query electromagnetic wave; and a toy including a query circuit and an interaction circuit, the query circuit being operable to emit the query electromagnetic wave and receive the answer electromagnetic wave, and the interaction circuit being operable to select an output perceptible by the user based on the answer electromagnetic wave.

[0006] In accordance with at least one further aspect of the present invention, an apparatus includes: a plurality of radio frequency tags operable to a query electromagnetic wave; and a toy including a query circuit and an interaction circuit, the query circuit being operable to emit the query electromagnetic wave and receive one or more of the answer electromagnetic waves, and the interaction circuit being operable to select an output perceptible by a user based on which of the one or more answer electromagnetic waves are received.

[0007] In accordance with at least one still further aspect of the present invention, a method includes: providing at least one mobile item operable to be carried by a user and emit an answer electromagnetic wave in response to receiving a query electromagnetic wave; providing a toy operable to emit

the query electromagnetic wave and receive the answer electromagnetic wave; and selecting an output to issue from the toy that is perceptible by the user based on the answer electromagnetic wave.

[0008] Other features, aspects, advantages and the like with become apparent to one skilled in the art when the disclosure herein is taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] For the purposes of illustrating the invention, there are shown in the drawings forms which are presently preferred, it being understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown.

[0010] FIG. 1 is a block diagram illustrating a conventional apparatus for facilitating communication between a base and a toy in accordance with the prior art;

[0011] FIG. 2 is a block diagram illustrating a method and/or apparatus for facilitating communication between a user and a toy in accordance with at least one aspect of the present invention;

[0012] FIG. 3 is a block diagram illustrating an example of circuitry which may be employed to facilitate the communication between the user and the toy in accordance with one or more aspects of the present invention;

[0013] FIG. 4 is a block diagram illustrating an apparatus and/or method of facilitating communication between one or more users and a toy and/or one or more locations in which the user(s) and toy may be deposed in accordance with one or more further aspects of the present invention; and

[0014] FIG. 5 is a flow diagram illustrating an example of the process steps that may be carried out in accordance with the invention shown in FIGS. 2, 3, or 4.

DETAILED DESCRIPTION

[0015] FIG. 2 is a block diagram of an apparatus 100 suitable for facilitating communication between a user 102,

such as a child, and a toy 104 in accordance with one or more aspects of the present invention. The apparatus 100 preferably includes at least one mobile item 106 having an RF tag 108, and the toy 104, which includes an interaction circuit 110 and a query circuit 130. The one or more mobile items 106 may take on any suitable form, where a piece of apparel is most preferred, such as a ring, a bracelet, a necklace, a glove, a belt, a hat, a pair of glasses, etc.

[0016] The one or more mobile items 106 are preferably operable to be carried by the user 102 and the RF tag 108 is preferably operable to produce an "answer" electromagnetic wave in response to receiving a "query" electromagnetic wave from the query circuit 130 of the toy 104. The RF tag 108 may be implemented utilizing any of the known technologies, such as the use of a RF transponder having an antenna, rectification power supply, logic/memory, a receiver, and an oscillator. Additional details concerning this type of RF tag 108 may be found in U.S. Patent No. 5,912,632, entitled SINGLE CHIP RF TAG OSCILLATOR CIRCUIT SYNCHRONIZED BY BASE STATION MODULATION FREQUENCY, the entire disclosure of which is hereby incorporated by reference. Alternatively, the RF tag 108 may be implemented utilizing resonant LC circuitry, which is significantly less complex. Additional details concerning the use of resonant RF tags may be found in U.S. Patent No. 5,661,470, entitled OBJECT RECOGNITION SYSTEM, the entire disclosure of which is hereby incorporated by reference.

[0017] The query circuit 130 is preferably operative to produce the query electromagnetic wave either periodically or otherwise such that when the mobile item 106 comes within sufficient proximity to the toy 104, the query circuit 130 is operable to receive the answer electromagnetic wave issued from the RF tag 108. The interaction circuit 110 is preferably operable to select and issue an output that is perceptible by the user 102 and that is based on the answer electromagnetic wave. By way of example, the toy 104 may be a stuffed animal, e.g., a teddy bear, and the interaction circuit 110 may be

operable to issue an audible output based on an answer electromagnetic wave issued by the RF tag 108. When the user 102, carrying the mobile item 106, comes sufficiently close to the toy 104, for example, when the user 102 enters a room in which the toy 104 is located, the query circuit 130 may issue a query electromagnetic wave causing the RF tag 108 to issue an answer electromagnetic wave. The query circuit 130 may then provide an indication to the interaction circuit 110 that an answer electromagnetic wave was received. In response, the interaction circuit 110 may issue an appropriate audible output, for example, "Teddy would love a hug." As the interaction circuit 110 would not issue the audible output until the user 102, carrying the mobile item 106, came within proximity to the toy 104, it would appear that the toy 104 issued the audible output in response to the user 102 himself. Advantageously, this yields enjoyable interactive play between the user 102 and the toy 104.

[0018] With reference to FIG. 3, additional details concerning the query circuit 130 and interaction circuit 110 will now be described. The query circuit 130 preferably includes a send circuit 132 operable to produce the query electromagnetic wave, and a sense circuit 134 operable to receive the answer electromagnetic wave. Any of the known circuit topologies and/or techniques may be employed in implementing the send circuit 132 and the sense circuit 134. As illustrated, the send circuit 132 and the sense circuit 134 includes an antenna 132A, 134A, respectively, it being understood that a single antenna may be employed when suitable circuit techniques are used.

[0019] The interaction circuit 110 preferably includes a microprocessor 112 operating under the control of a suitable software program. The interaction circuit 110 also preferably includes a memory 114, a power supply 116, an output circuit 118, and one or more output transducers 120. The memory 114 is preferably operable to store the software program mentioned above and/or a plurality of selectable outputs, which will be

described in more detail hereinbelow. The power supply 116 is preferably operable to supply operating voltage and current to the various circuits within the toy 104, it being most preferred that the power supply 116 is controllable by the microprocessor 112 to selectively supply the operating voltage and current to at least some of the circuits. The output circuit 118 is preferably operable to convert a signal issued by the microprocessor 112 that corresponds to the selected output into another signal suitable for driving the one or more output transducers 120. For example, the output transducers 120 may include at least one of an audio transducer (such as a speaker); a visual transducer (such as one or more lights, a video display, etc.); a tactile transducer (such as a vibrating element, a heating element, a cooling element, etc.); and a mechanical transducer (such as a motorized element or elements directed to movement of the toy 104). Depending on the type and number of output transducers 120, the output circuit 118 includes the necessary circuitry for driving such transducers 120. Any of the known circuit configurations and/or techniques may be employed in implementing the output circuit 118.

[0020] In accordance with at least one aspect of the present invention, the memory 114 preferably stores a plurality of outputs selectable by the microprocessor 112. For example, the selectable outputs may include a plurality of phrases that, when issued as audible signals from the output transducer 120 (such as a speaker), result in suitable interactive play between the user 102 and the toy 104. In accordance with at least one further aspect of the present invention, a plurality of mobile items 106 are preferably employed, where each mobile item 106 includes a separate RF tag 108, such as RF tag 1, RF tag 2, ... RF tag N. The respective RF tags 1, 2, ... N are preferably operable to issue differing answer electromagnetic waves that are distinguishable by the sense circuit 134 and/or the microprocessor 112. Irrespective of whether one or many

mobile items 106 are employed, the microprocessor 112 is preferably operable to select one of the plurality of selectable outputs (such as a particular phrase) corresponding to the received answer electromagnetic wave. When a plurality of mobile items 106 are employed, the output issued by the output transducer 120 may be dependent on which of the one or more mobile items 106 came within proximity of the toy 104.

[0021] By way of illustration, if the memory 114 includes two selectable phrases, namely, phrase 1: "Hello mommy;" and phrase 2: "Hello daddy," the software program may be implemented such that the microprocessor 112 selects phrase 1 when the answer electromagnetic wave issued by RF tag 1 is received by the sense circuit 134 and/or selects phrase 2 when the answer electromagnetic wave issued from RF tag 2 is received by the sense circuit 134. Thus, the user 102 may select one or more of the mobile items 106 to suit his or her desires for interactive play. Alternatively, more than one user 102 may take part in the interactive play, where one of the users 102 possesses a first mobile item 106 and another user 102 possess a second mobile item 106.

[0022] In accordance with at least one further aspect of the present invention, the interaction circuit 110 is preferably operable to associate a user defined output with one or more answer electromagnetic waves such that the interaction circuit 110 is operable to select the user defined output based on receiving the associated answer electromagnetic wave. For example, the user 102 may be prompted by the interaction circuit 110 as to which of phrases 1 and 2 (i.e., a user defined phrase) should be associated with the answer electromagnetic wave issued from the first mobile item 106 and from the second mobile item 106, respectively.

[0023] Alternatively, when only one mobile item 106 is employed, the user 102 may be prompted to select which one or more stored phrases should be issued by the output transducer

120 in response to the answer electromagnetic wave received from that mobile item 106.

[0024] In accordance with at least one further aspect of the invention, the interaction circuit 110 is preferably operable to receive a user defined phrase from the user 102 and associate the user defined phrase with one or more of the answer electromagnetic waves, specified by the user 102. For example, the microprocessor 112 may be operable to receive the user defined phrase through a port 122 (e.g., a data port) or through the output transducer 120 (e.g., a speaker operating as a microphone) and to store the user defined phrase in the memory 114 for selection when the associated answer electromagnetic wave is received. By way of illustration, the user 102 may input his or her name (i.e., a user defined phrase) into the interaction circuit 110 such that the toy 104 greets the user 102 by name.

[0025] In accordance with at least one further aspect of the present invention, the microprocessor 112 is preferably operable to turn on certain portions of the interaction circuit 110 in response to the detection of an answer electromagnetic wave. For example, the power supply 116 may supply sufficient "stand by" power for the send circuit 132 and sense circuit 134 to perform their functions from time to time, but not supply power to other portions of the interaction circuit 110, such as the memory 114, the output circuit 118, the output transducers 120, etc. When an answer electromagnetic wave is received by the sense circuit 134, however, the microprocessor 112 is preferably operable to signal the power supply 116 to provide power to the other circuits in order to facilitate issuing an output from the one or more output transducers 120 that is perceptible by the user 102. Advantageously, this can conserve power and prolong use of the toy 104.

[0026] Reference is now made to FIG. 4, which is a block diagram illustrating one or more further aspects of the present invention. In particular, FIG. 4 illustrates an

apparatus 200 including a plurality of RF tags 1, 2, ... N, preferably disposed at different locations A, B, etc.; at least one toy 104, such as that shown and described hereinabove with respect to FIGS. 2 and 3; and at least one further RF tag 108 in the possession one or more users 102, preferably within one or more mobile items 106.

[0027] With reference to FIGS. 4 and 5, a flow diagram is shown illustrating process actions that may take place in accordance with the invention shown in FIG. 4. When the process has started, the interaction circuit 110 preferably makes a determination as to whether any RF tag is in proximity to the toy 104 (action 300). If no RF tag is in the vicinity of the toy 104, the process flow loops back to action 300 until an RF tag is detected. At that point, the interaction circuit 110 preferably determines which of the one or more RF tags are in the vicinity of the toy 104. This may be carried out in parallel (as shown in FIG. 5) or serially without departing from the scope of the invention. In particular, the interaction circuit 110 preferably determines whether RF tag 1 is in the vicinity of the toy 104 (action 302) if so, the interaction circuit 110 preferably stores information indicating that the RF tag 1 is present (action 304). If RF tag 1 is not in the vicinity of the toy 104, then the process flow moves to action 306. Similar determinations are made as to whether RF tag 2 is in the vicinity of the toy 104 (e.g., actions 308, 310) and whether other RF tags, such as RF tag N is in the vicinity of the toy 104 (e.g., actions 312, 314).

[0028] The interaction circuit 110 is preferably capable of discriminating between the plurality of RF tags 1, 2, ... N from the plurality of locations A, B, ... N and/or the plurality of mobile items 106 using any of the known techniques. For example, each RF tag may issue an answer electromagnetic wave at a slightly different frequency in response to the query electromagnetic wave. Thus, the interaction circuit 110 may discriminate between the frequencies of the answer electromagnetic waves in determining

whether a particular RF tag is in the vicinity of the toy 104. Alternatively, the answer electromagnetic waves may include a unique code identifying the RF tag from which it is issued and the interaction circuit 110 may discriminate between the RF tags based on the extraction of the unique codes from the received answer electromagnetic waves. In either of these two cases, or using any other known technique, the interaction circuit 110 preferably stores information as to whether one or more of the RF tags are in the vicinity of the toy 104. By way of example, this may achieved by the microprocessor 112 assigning (e.g., tagging, creating, etc.) an index number, e.g., 001, 002, ... 00N when the sense circuit 134 provides an indication that a particular answer electromagnetic wave has been received. The index number may then be stored in memory 114 for later reference.

[0029] The interaction circuit 110 is preferably operable to select an output perceptible by the one or more users 102 in response to answer electromagnetic wave(s) received from one or more of the plurality of RF tags 1, 2, ... N (such as from locations A, B, ... N and/or mobile items 106). It is most preferred that the interaction circuit 110 select an output, such as a phrase, that includes characteristics that correspond to one or more of the locations, A, B, ... and/or N, from which the answer electromagnetic wave(s) are received. For example, the locations A, B, ... N may represent rooms in the home of the user 102, such as a kitchen, a living room, a dining room, a family room, a bedroom, a bathroom, a basement, a garage, a foyer, an attic, a hallway, etc. When RF tag 1 is dispose at location A, for example, a kitchen, the answer electromagnetic wave issued by the RF tag 1 preferably includes information identifying location A as such, e.g., by way of unique code or frequency of oscillation. When RF tag 2 is disposed at location B, a bedroom, the answer electromagnetic wave issued by the RF tag 2 preferably includes information identifying location B as such, etc. The interaction circuit 110 preferably selects an appropriate

output from among the plurality of stored outputs based on which RF tags are present. In particular, the microprocessor 112 may retrieve the stored index number(s) from the memory 114 indicating which of RF tags were found to be in the vicinity of the toy 104. An appropriate output may then be selected by the microprocessor 112 based on the index numbers.

[0030] By way of example, index number 001 may be associated with location A, e.g., the kitchen; index number 002 may be associated with location B, e.g., the bedroom, etc. When the microprocessor 112 determines that an RF tag of a mobile item 106 is in the vicinity of the toy 104 and that RF tag 1 of location A (e.g., the kitchen) has been sensed (e.g., actions 302, 304), then the microprocessor 112 may select the phrase "Its time for breakfast" (action 306). Alternatively, when the microprocessor 112 determines that RF tag 2 of location B (e.g., the bedroom) has been sensed (e.g., actions 308, 310), then the microprocessor 112 may preferably select the phrase "Its time for bed." Still further, when the RF tag of the mobile item 106 has been associated with a particular user defined phrase (such as the user's name), the microprocessor 112 may be operable to select the phrase "John, its time for bed."

[0031] When the selection of the appropriate output is complete (action 306), then the process loops back to action 300.

[0032] It will be apparent to the skilled artisan having read the disclosure herein that many differing combinations of RF tags, mobile items 106, users 102, toys 104, and outputs may be employed without departing from the spirit and scope of the invention.

[0033] Although the invention herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other

arrangements may be devised without departing from the spirit and scope of the present invention as defined by the appended claims.